# PATENT ABSTRACTS OF JAPAN

(11)Publication number : **08-006610**
(43)Date of publication of application : **12.01.1996**

(51)Int.CI. **G05B 19/02**
**G05B 19/05**

(21)Application number : **06-134691**
(22)Date of filing : **16.06.1994**

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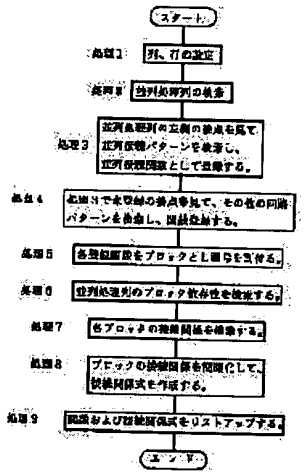
## (54) METHOD FOR COMPRESSING SEQUENCE DATA

(57)Abstract:
PURPOSE: To generate the sequence data in a compressed state by retrieving the connection relation among respective blocks while regarding registered functions as one block and then generating a connection relational expression, and representing the sequence data with the functions of the respective blocks and the connection relational expression.
CONSTITUTION: Columns and rows are specified on a ladder circuit diagram (process 1) and parallel process columns as circuit patterns of parallel connection is retrieved (process 2). Contacts of parallel connections are registered as functions by checking the left sides of the respective retrieved parallel process columns (process 3). Then unregistered contacts are retrieved and function registration is performed (process 4); and the respective registered functions are numbered as blocks (process 5). After which block a branch connected to the left side of each parallel process column is in is retrieved (process 6), the connection relation among the respective blocks is retrieved (process 7), and the connection relational expression is generated (process 8). The sequence data compressed according to the functions of the respective blocks and the connection relational expression are obtained.




LEGAL STATUS

| | |
|---|---|
| [Date of request for examination] | 10.12.1998 |
| [Date of sending the examiner's decision of rejection] | |
| [Kind of final disposal of application other than the examiner's decision of rejection or application converted registration] | |
| [Date of final disposal for application] | |
| [Patent number] | 3376693 |
| [Date of registration] | 06.12.2002 |
| [Number of appeal against examiner's decision of rejection] | |
| [Date of requesting appeal against examiner's decision of rejection] | |
| [Date of extinction of right] | |

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CLAIMS

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[Claim(s)]

[Claim 1] The stage of defining the circuit pattern by specific connection as a function from the circuit used for a ladder view, It searches whether it is all over the ladder view where the circuit pattern which is in agreement with the circuit pattern by this specific connection creates sequence data. The stage of registering a pattern in agreement as a function by the aforementioned definition, and each of the this registered function as one block The compression method of the sequence data characterized by becoming the stage which searches the connection relation of each block and creates connection relational expression more, and expressing sequence data with the function and connection relational expression of each aforementioned block.

[Claim 2] The compression method of the sequence data according to claim 1 characterized by the circuit patterns by the aforementioned specific connection being the pattern to which the contact was connected in series, the pattern to which the contact was connected in parallel, the pattern with which a contact exists independently, the pattern by which the output coil was connected in series with the contact, and a pattern with which an output coil exists independently.

[Claim 3] The pattern to which the contact was connected in series from the circuit pattern used for a ladder view (series connection), The pattern (parallel connection) to which the contact was connected in parallel, the pattern with which a contact exists independently (independent contact), The stage of defining as a function the pattern (contact output) by which the output coil was connected in series with the contact, and the pattern (independent output) with which an output coil exists independently, The stage of setting up the lengthwise train and the lateral line from which the one branch point becomes one partition on the ladder view which creates sequence data, The stage of searching the portion with which there is two or more branching extended on the left of all these trains to the train other than the common line in the aforementioned ladder view, and the branching is connected by the train as a parallel processing train, The stage of searching whether the circuit pattern which is in agreement with the pattern of the aforementioned parallel connection being in the left-hand side of this parallel processing train, The stage of registering the contact which serves as parallel connection by this reference result as a function of parallel connection, All the contacts that are not registered in the stage of registering this parallel connection are searched. The stage which searches whether it is in agreement with patterns other than the pattern of parallel connection, and is registered as a function of the congruous patterns, The stage which considers the registered this function as a block for every function, and the stage of searching which [ of each aforementioned block ] being connected to the left-hand side of the aforementioned parallel processing train to each parallel processing train, The stage which creates the connection relational expression with which the connection relation of blocks is expressed from the result searched according to the stage of searching the connection relation of each aforementioned blocks, and the stage of searching the aforementioned connection relation, The compression method of the sequence data characterized by becoming more and expressing sequence data with the function and the aforementioned connection relational expression of each aforementioned block.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the compression method of the sequence data which are applied to the compression method of sequence data, for example, are used for a programmable controller etc.
[0002]
[Description of the Prior Art] There are some production machines which are used in works and which are therefore controlling the operation to the programmable controller (it outlines Following PC). Since this PC is a kind of computer, in order to operate this, it needs to input a program. The input of this program is performed drawing a ladder sequence with an input unit.
[0003] For example, what is necessary is just to input with an input unit so that it may become a ladder view as this drawing in inputting a ladder program as shown in drawing 19 . Specifically, A contact of R1 is inputted, A contact of R2, R3, and R4 is inputted so that it may next become this contact and serial, and a contact R9 is inputted so that it may become still more in parallel with this A contact of R1. Moreover, R5 and R6 are inputted so that it may become in parallel with R2 and R3. The circuit as shown in drawing is constituted performing such an input one by one.
[0004] Thus, R2 and R3 are in the contact R9 which this translation has in parallel [ a contact R1 and a degree ] with this contact usually first although it will translate into according to languages, such as machine language, so that inputted ladder view can interpret PC sequence data and a store will be carried out to the storage, and a degree in series, and it connected with R1, and has connected with R9. A translation to a machine language is performed looking at a ladder view in this way one by one. Thus, the translated sequence data are shown in drawing 20 .
[0005]
[Problem(s) to be Solved by the Invention] However, as illustrated, the sequence data constituted as mentioned above will become long as one program, and will need many capacity of the storage. This also has the problem that much communication time is required, when a designer etc. moves this program to PC after program development besides needing many capacity of a storage.
[0006] Then, in case the purpose of this invention creates sequence data from a ladder view, it is offering the compression method of the sequence data which can create sequence data in the state it having been compressed.
[0007]
[Means for Solving the Problem] The stage of defining the circuit pattern by specific connection as a function from the circuit where this invention for attaining the above-mentioned purpose is used for a ladder view, It searches whether it is all over the ladder view where the circuit pattern which is in agreement with the circuit pattern by this specific connection creates sequence data. The stage of registering a pattern in agreement as a function by the aforementioned definition, and each of the this registered function as one block It is the compression method of the sequence data characterized by becoming the stage which searches the connection relation of each block and creates connection relational expression more, and expressing sequence data with the function and connection relational expression of each aforementioned block.
[0008] In this invention, the circuit pattern by the aforementioned specific connection is characterized by being by the pattern to which the contact was connected in series, the pattern to which the contact was connected in parallel, the pattern with which a contact exists independently, the pattern by which the output coil was connected in series with the contact, and the pattern by which an output coil exists independently.
[0009] Moreover, the pattern to which the circuit pattern with which this invention is used for a ladder view to the contact was connected in series (series connection), The pattern (parallel connection) to which the contact was connected in parallel, the pattern with which a contact exists independently (independent contact), The stage of defining as a function the pattern (contact output) by which the output coil was connected in series with the contact, and the pattern (independent output) with which an output coil exists independently, The stage of setting up the lengthwise train and the lateral line from which the one branch point becomes one partition on the ladder view which creates sequence data, The stage of searching the portion with which there is two or more branching extended on the left of all these trains to the train other than the common line in the aforementioned ladder view, and the branching is connected by the train as a parallel processing train, The stage of searching whether the circuit pattern which is in agreement with the pattern of the aforementioned parallel connection being in the left-hand side of this parallel processing train, The stage of registering the contact which serves as parallel connection by this reference result as a function of parallel connection, All the contacts that are not registered in the stage of registering this parallel connection are searched. The stage which searches whether it is in agreement with patterns other than the pattern of parallel connection, and is registered as a

function of the congruous patterns, The stage which considers the registered this function as a block for every function, and the stage of searching which [ of each aforementioned block ] being connected to the left-hand side of the aforementioned parallel processing train to each parallel processing train, The stage which creates the connection relational expression with which the connection relation of blocks is expressed from the result searched according to the stage of searching the connection relation of each aforementioned blocks, and the stage of searching the aforementioned connection relation, It is the compression method of the sequence data characterized by becoming more and expressing sequence data with the function and the aforementioned connection relational expression of each aforementioned block.

[0010]

[Function] The portion of the same pattern as the circuit which this invention constituted as mentioned above defined as a function the circuit pattern which has specific connection from the circuit which constitutes a ladder view, and was defined as a function all over the ladder view is searched. Since [ with the connection relational expression showing the connection relation of blocks with each function of this block ] it registers with the defined function, this is considered as one block and sequence data are expressed, the amount of data can be lessened as compared with the conventional sequence data.

[0011] Moreover, the pattern to which the circuit pattern defined as a function was connected in series in the contact in this invention, By considering as the pattern to which the contact was connected in parallel, the pattern with which a contact exists independently, the pattern by which the output coil was connected in series with the contact connected in series, and the pattern with which an output coil exists independently The circuit used for the ladder view can be expressed with either of the functions of this defined circuit pattern.

[0012] Moreover, the pattern to which, as for this invention, the circuit pattern of the contact in a ladder view was connected in series in the contact (series connection), The pattern (parallel connection) to which the contact was connected in parallel, the pattern with which a contact exists independently (independent contact), As the pattern (contact output) by which the output coil was connected in series with the contact connected in series, and a pattern (independent output) with which an output coil exists independently Define these as a function and the mesh by the train and the line is bet on the ladder view which creates sequence data. First, search whether the train (parallel processing train) to which parallel processing is carried out is searched, and parallel connection is in the train, then circuit patterns other than parallel connection are searched. It is made for the function of each block of sequence data and the connection relational expression of blocks to express by registering a function, blocking each circuit pattern, searching the connection relation of this block, and creating connection relational expression. Thereby, the amount of data can be lessened as compared with the conventional sequence data.

[0013]

[Example] Hereafter, the example of this invention is explained with reference to the appended drawing.

[0014] In this example, compressed sequence data are created from the ladder view shown in above-mentioned drawing 19 .

[0015] The specific pattern in a ladder view is first defined as this as a function. In this example, a function is defined, respectively about the circuit pattern with which the circuit pattern of a series connection, the circuit pattern of parallel connection, the circuit pattern with which a contact exists independently, the circuit pattern with which an output coil exists following a series connection, and an output coil exist independently.

[0016] As shown in drawing 1 , each contacts R1, R2, and R3 and --Rn are connected continuously, and between the contact, the circuit pattern of a series connection does not have a branch line, and defines this like (1) formula.

F1**n**R1**R2**R3** -- **Rn (1)

(1) In a formula, the function name and n to which F1 expresses a series connection are the number of contacts (however, "**" expresses a space and presupposes below that it is the same in this specification).

[0017] Each contacts R1, R2, and R3 and --Rn are connected in parallel, and the circuit pattern of parallel connection defines this like (2) formulas, as shown in drawing 2 .

F2**n**R1**R2**R3** -- **Rn (2)

(2) In a formula, the function name and n to which F2 expresses parallel connection are the number of contacts.

[0018] As shown in drawing 3 , the circuit pattern with which a contact exists independently does not have the contact which Contact Rx exists independently, and there is no contact which is in agreement with the pattern of the aforementioned series connection before and behind it, and is in agreement with the pattern of the aforementioned parallel, and defines this like (3) formulas.

F0**Rx (3)

(3) In a formula, F0 is a function name showing the circuit pattern with which a contact exists independently.

[0019] There are at least one or more contacts in front of the output coil Ox, and there is no branching between the contacts and contact, and output coil, it connects with it in series, and the circuit pattern with which an output coil exists following in-series processing defines this like (4) formulas, as shown in drawing 4 .

G1**n**R1**R2**R3** -- **Rn**Ox (4)

(4) In a formula, G1 is a function name showing the circuit pattern with which an output coil exists following in-series processing, and n is the number of contacts.

[0020] As shown in drawing 5 , the output coil Ox exists independently, and before an output coil, the circuit pattern with which an output coil exists independently does not have the contact which there is no branching and connected in series, and defines this like (5) formulas.

G0**Ox (5)

(5) In a formula, G0 is a function name to which an output coil expresses the circuit pattern which exists independently.

[0021] In addition, when in the case of B contact as a contact shows to Rm of drawing 6 attaching "N" before a contact and having begun from the common line, "C" is attached before a function name. For example, when shown in drawing 6 , it comes to be shown in (6) formulas.
CF1**n**R1**R2**R3** -- **NRn (6)
It goes into creation of the sequence data compressed from the ladder view, after defining a circuit pattern as a function as mentioned above.
[0022] processing 1 -- first, as shown in drawing 7 , a train and a line are specified on a ladder view It is made for the branch point not to go into each train and a line only in one. In illustrating, it becomes four trains and five lines. Thus, after specifying a train and a line, each circuit pattern mentioned above is searched one by one on the basis of this train and line.
[0023] Reference of a processing 2 circuit pattern is begun from reference of parallel connection. First, a parallel processing train is searched. It searches in this sequentially from the train of the nearest side of a common line, goes to it, it has two or more branching extended on the left of the train, and the portion with which the branching is connected by the train is regarded as a parallel processing train. If a parallel processing train is found, the line (start line) of the beginning of the train and the last line (END line) will be checked and listed.
[0024] For example, in drawing 7 , since there is two branching which has come out on the left of the 1st train if reference of this parallel processing train looks at eye the 1st train and the branching is connected by the 1st train, it turns out that this 1st train is a parallel processing train. And there is the 1st start line of this train and the number of the END lines is the 5th. In the 2nd line, two or more branching has come out to the left, and since it is connected, it is a parallel processing train, and there is the 4th start line and the number of the END lines is the 5th. A parallel processing train is searched about eye the 3rd train and eye the 4th train like the following. In addition, a start line and the END line are the start of a train when the parallel processing train was checked, and the end, and are not from branching to the next branching here (although branching is the 1st line and the 4th line number in reference and the 1st train about the 1st train, the start of this train is the 1st line and the number of ends is the 5th). When this is performed in order and listed about each train, it comes to be shown in Table 1.
[0025]
[Table 1]

| ビット番号 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| 並列処理列 | 1 | 2 | 3 | 4 |
| スタート行 | 1 | 4 | 1 | 3 |
| エンド行 | 5 | 5 | 3 | 5 |

[0026] However, front Naka and a bit number are numbers given in order of the parallel processing train.
[0027] Processing 3, next the listed left-hand side of each train of a parallel processing train are seen, and the contact used as parallel connection is registered as a function. This registration registers a registration function, and a start train and a start line, as shown in Table 2.
[0028]
[Table 2]

| 登録関数 | スタート列 | スタート行 |
|---|---|---|
| CF2△2△R1△R9 | コモン線 | 1 |
| F2△2△R10△R11 | 1 | 4 |
| F2△2△R6△R7 | 2 | 2 |

[0029] As shown in Table 2, a registration function is F2 which shows parallel connection, and since front Naka CF2 -- has started from the common line, C is attached. And the number of contacts is two and contacts are R1 and R9. moreover, in the portion of the bit number 3 in Table 1 listed as a parallel processing train, a contact exists in parallel -- ****'s (it is not a parallel circuit pattern) -- it does not become a registration function (there is nothing all over Table 2) It means that contacts R1, R6, R7, R9, and R10 were registered by this.
[0030] Processing 4, next every one contact which is not registered even here are searched, and circuit patterns other than parallel connection are searched.
[0031] In this, it starts with what has a contact number young among the contacts which are not registered until now first. since contacts R1, R6, R7, R9, and R10 are already registered in the case of this example -- R2 of the youngest number at contacts other than this -- seeing -- this right from R2 -- branching -- even coming out -- if it searches, R3 will come out If it goes to the right then, since branching will come out, reference is ended. Thereby, it turns out that R2 and R3 are connected in series. Since the output coil O1 will come out if the following R4 is applicable and goes to the right, since R3 was now registered when other contacts were searched similarly, the output coil is connected with R4 in series. Since R5 has branching shortly after going to the right, it is an independent contact. It is a having [ R8 ]-immediately-branching independent contact. Since the output coil O3 will come out of it if R12 goes to the right, the output coil is connected with R12 in series. Moreover, O2 is an existing-independently independent output coil. If the above reference result is registered as a function, it will become as it is shown in Table 3.
[0032]
[Table 3]

| 登録関数 | スタート列 | スタート行 |
|---|---|---|
| F1△2△R2△R3 | 1 | 1 |
| G1△1△R4△O1 | 3 | 1 |
| F0△R5 | 1 | 2 |
| F0△R8 | 3 | 3 |
| G0△O8 | 4 | 3 |
| G1△1△R12△O3 | 4 | 5 |

[0033] processing 5 -- since reference of all contacts is completed at this time and the registration as a function in each circuit pattern is completed, as a block, a number is attached and each registration function is listed, as shown in Table 4 Moreover, what applied this the block of each on the ladder view is shown in drawing 8 .

[0034]

[Table 4]

| ブロック番号 | 登録関数 | スタート列 | スタート行 |
|---|---|---|---|
| A | CF2△2△R1△R9 | コモン線 | 1 |
| B | F2△2△R10△R11 | 1 | 4 |
| C | F2△2△R6△R7 | 2 | 2 |
| D | F1△2△R2△R3 | 1 | 1 |
| E | G1△1△R4△O1 | 3 | 1 |
| F | F0△R5 | 1 | 2 |
| G | F0△R8 | 3 | 3 |
| H | G0△O2 | 4 | 3 |
| I | G1△1△R12△O3 | 4 | 5 |

[0035] Processing 6, next the parallel processing train listed to Table 1 are seen, and it searches which block branching connected to the left-hand side of each parallel processing train is. This block is called the dependence block of each parallel processing train. This reference result is Table 5.

[0036]

[Table 5]

| ビット番号 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| 並列処理列 | 1 | 2 | 3 | 4 |
| スタート行 | 1 | 4 | 1 | 3 |
| エンド行 | 5 | 5 | 3 | 5 |
| 依存ブロック | A | B | D/C | G/B |

[0037] The block with which, as for the bit number 0 in Table 5, the left to branching is connected to this train since a parallel processing train is eye the 1st train is Block A (refer to drawing 8 ). Similarly, the bit number 2 is eye the 3rd train, the dependence block is Block D and Block C, the bit number 1 is eye the 2nd train, the dependence block is Block B, and the dependence block is [ the bit number 3 is eye the 4th train, and ] Block G and Block B. here -- the bit numbers 2 and 3 -- a dependence block -- two -- it is (it expresses front Naka D/C and G/B) -- this means that the block is parallel (the OR of the output of a block outputs), as shown in drawing 9

[0038] Processing 7, next the connection relation of each block are searched. Or or a check is carried out, and when [ the start train number of each block shown in Table 4 and whose train number of the parallel processing train in Table 5 correspond with this ] in agreement, it checks whether it is between the END lines from the start line of a train with which the start line number of Table 5 of Table 4 of the block corresponds. When these conditions are in agreement, the bit number in Table 5 is described and the block which was in agreement with the "+" sign is tied up. For example, since in Block B the start line of Block B is contained in this since a start train is the 1st train, there is the 4th start line of this of Block B in accordance with the parallel processing train 1 of the bit number 0 of Table 5 and the start of the bit number 0 and the END line are 1-5, and conditions are fulfilled, a connection relation is set to 0+B. In addition, when a start train is a common line in Table 4, it ignores.

[0039] Thus, when a connection relation is searched, there is also a block which is not in agreement with the above-mentioned conditions. Such a block looks at the contact connected to the left of the block, makes the left the block with which the contact is registered, and connects it with the "+" sign. Since it is R5 when the contact connected to the left of this block C is seen in the case of this example, since Block C does not fulfill the parallel processing train and the above-mentioned conditions of each bit number of Table 5, it is the block F with these R5. Therefore, this connection relation serves as F+C (refer to drawing 8 ). The result which followed each block in connection-related reference as mentioned above is Table 6.

[0040]

[Table 6]

0+B
F+C
0+D
2+E
0+F
2+G
3+H
3+I

[0041] Each block with which the result processing 8, next connection-related which were shown in Table 6 is connected with the same bit number as origin is collectively made into the connection relational expression of a block. As shown in drawing 10, first, out of Table 6, the thing of the same bit number is extracted, and to one bit number, a block is packed into this and it connects with it with the "+" sign. The turn of a block is connected to the young numerical order of the start line in Table 4. It connects with the dependence block of one bit number, and the packed block is the block located in parallel mutually. Then, it transposes to the dependence block of each bit number which showed the bit number portion in Table 5, and considers as the connection relational expression of a block.
[0042] As what remained by this, without being collected into Table 6 expresses with one connection relation what remained, it is taken as a new block. In the case of this example, since what remains is one of the F+C, it connects the function of a block in this case, expresses it in one as "F0**R5**F2**2**R6**R7", and newly considers this as Block J.
[0043] Thus, when a new block is completed, a new block and the block which became are transposed to a new block name out of the connection relational expression ( drawing 10 ) of a block. In the case of this example, F or all C are set to J.
[0044] The function data which is the function of each block, and the connection data which are the connection relational expression of each block are completed by nine or more <U> processings. This is shown in Table 7 and 8. It becomes sequence data with which this was compressed.
[0045]
[Table 7]

| 関数データ |
|---|
| CF2△2△R1△R9=A |
| F2△2△R10△R11=B |
| F1△2△R2△R3=D |
| G1△1△R4△O1=E |
| F0△R8=F |
| G0△O2=H |
| G1△1△R12△O3=I |
| F1△R5△F2△2△R6△R7=J |

[0046]
[Table 8]

| 接続データ |
|---|
| A+DJB |
| D/J+EG |
| G/B+HI |

[0047] Explanation of the flow chart which shows the flow of processing of the compression method of the sequence data explained above to drawing 11 sets a train and a line as a ladder view first (processing 1). Next, a parallel processing train is searched and this is listed (processing 2). Next, the block pattern which looks at the contact on the left-hand side of a parallel processing train, and serves as parallel connection is searched, and it registers as a parallel connection function (F2) (processing 3). Next, the contact which is not registered by the aforementioned processing 3 is seen, block patterns other than parallel connection are searched, and it registers as a function (processing 4). Next, the registered function is considered as a block and a block number is assigned to each block (processing 5). Next, the block dependency of the parallel processing train is searched from branching on the left of a parallel processing train (processing 6). Next, the connection relation of each block is searched (processing 7). Next, the connection relation of a block is simplified and connection relational expression is created (processing 8). Next, the function and connection relational expression of each block are listed, and it ends (processing 9).
[0048] Thus, the completed function, the function data based on connection relational expression, and connection data turn into sequence data. It turns out that it is small as data clearly as compared with the data ( drawing 20 ) based on the conventional machine language which mentioned this above. Thereby, in the cases, such as data transfer and storing of data, since what is necessary is telling only this function and connection relational expression, or just coming to memorize, it becomes possible to aim at shortening of a data transfer time, and a deployment of a storage.
[0049] Here, a ladder view is restored from the compressed data created as mentioned above, i.e., the sequence data which consist of function data and connection data.
[0050] First, it asks for the connecting location of each block from connection data. Connection data A+DJB shows that Block

DJB is connected to Block A, it turns out that Blocks E and G have connected with the output of Blocks D and J from D/J+EG, and it turns out that Blocks H and I have connected with the output of Blocks G and B from G/B+HI. Drawing 12 is the block diagram drawn according to this connection relation.

[0051] Next, the circuit diagram for every block is created according to the definition of a function to the function of each block. Since Block A is "CF2**2**R1**R9", it begins from a common line, a contact is connected to two-piece parallel, and it turns out that this two contact is R1 and R9. Like the following, since Block B is "F2**2**R10**R11", a contact is connected to two-piece parallel and contacts are R10 and R11. Since Block D is "F1**2**R2**R3", a contact is connected to a two-piece serial and contacts are R2 and R3. Since Block E is "G1**1**R4**O1", an output is connected with a contact in series, a contact is R4, and an output is O1. Since Block G is "F0**R8", a contact exists independently and a contact is R8. Since Block H is "G0**O2", an output exists independently and an output is O2. Since Block I is "G1**1**R12**O3", an output is connected with a contact in series, a contact is R12, and an output is O3. the contact which exists independently since Block J is "F0**R5**F2**2**R6**R7", and the contact connected to two parallel -- then, an independent contact is R5 and parallel contacts are R6 and R7 It is drawing 13 which created each circuit diagram from the above function.

[0052] Next, as the circuit diagram for this the block of every is laid on top of the above-mentioned block diagram ( drawing 12 ) and is shown in drawing 14 , the connection diagram of the whole circuit is created. And this connection diagram side is optimized, and as shown in drawing 15 , restoration of a ladder view is completed. The ladder view shown in this drawing 15 is equivalent to the original circuit diagram ( drawing 19 ).

[0053] this invention is applied about the ladder from which the ladder view shown in drawing 19 and composition differ as other examples of this invention further hereafter, and the example which compressed sequence data is explained.

[0054] Drawing 16 is a ladder view which becomes origin. The sequence data compressed according to the procedure of this invention from this ladder view are created.

[0055] First, as shown in drawing 17 , a train and a line are set up on the ladder view of drawing 16 . In this case, it becomes four trains of three lines.

[0056] Next, a parallel processing train is searched and the table of a parallel processing train is created. Here, eye the 2nd train and eye the 4th train are a parallel processing train. A result is as in Table 9.

[0057]

[Table 9]

| ビット番号 | 0 | 1 |
|---|---|---|
| 並列処理列 | 2 | 4 |
| スタート行 | 1 | 1 |
| エンド行 | 3 | 2 |

[0058] Next, it searches whether the circuit pattern of parallel connection is in the left-hand side of a parallel processing train. In this ladder view, since R4 and R8 which are connected to eye the 4th train are parallel connection, this is registered as a function. Since R1 connected to eye the 2nd train, R2, R6 and R7, and R9 and R10 are not the patterns of parallel connection, it is careful. Then, other contacts which were not registered are seen, and it searches whether it is in agreement with circuit patterns other than parallel connection, and registers as a function, and a block number is attached by considering each function as a block. The result to the above is shown in Table 10.

[0059]

[Table 10]

| ブロック番号 | 登録関数 | スタート列 | スタート行 |
|---|---|---|---|
| A | CF2△2△R4△R8 | 3 | 1 |
| B | CF1△2△R1△R2 | コモン線 | 1 |
| C | F0△R3 | 2 | 1 |
| D | G1△1△R5△O1 | 4 | 1 |
| E | CF1△2△R6△R7 | コモン線 | 2 |
| F | CF1△R9△R10 | コモン線 | 3 |
| G | G0△O2 | 2 | 3 |

[0060] Next, the dependence block of each parallel processing train is searched. As this is shown in Table 11, B, E, and F are connected in parallel, and it depends for the 2nd train, and depends for the 4th train on Block A.

[0061]

[Table 11]

| ビット番号 | 0 | 1 |
|---|---|---|
| 並列処理列 | 2 | 4 |
| スタート行 | 1 | 1 |
| エンド行 | 3 | 2 |
| 依存ブロック | B/E/F | A |

[0062] Next, it asks for the connection relation by the bit number. Here, it asks by Table 10 and Table 11. The result is Table 12.

[0063]
[Table 12]
C+A
0+C
1+D
0+G

[0064] And it collects into the connection relational expression as a block from the result of Table 12. First, as shown in drawing 18 , it collects for every same bit number. Here, since it is only the bit number 0 which has a the same bit number, if this is summarized, it will serve as "B/E/F+CG." Although what is not summarized by the bit number as a connection relation remains at this time, since two connection relations remain unlike the above-mentioned, this is collectively considered as a new block here. "C+A" and "1+D" remain. Since the dependence block of the bit number 1 is A when this is summarized, [1+D" will become "C+A+D" if two which became "A+D", therefore remained are summarized. It will be set to "F0**R3**F2**2**R4**R8**G1**1**R5**O1" if this is expressed as a function. H is given to this as a new block number. And C of connection relational expression is transposed to H, and the function of each block and connection-related data are completed.
[0065] The function data of each completed block is shown table 14, and the connection data which are connection relational expression serve as "B/E/F+HG."
[0066]
[Table 13]

| 関数データ |
|---|
| CF2△2△R1△R2=B |
| CF1△2△R6△R7=E |
| CF1△2△R9△R10=F |
| G0△O2=G |
| F0△R3△F2△2△R4△R8△G1△1△R5△01=H |

[0067] The compressed sequence data are done like the case where this mentions above.
[0068]
[Effect of the Invention] As explained above, since [ according to the compression method of the sequence data of this invention / sequence data ] the specific circuit pattern was defined as a function from the circuit which constitutes a ladder and it expresses with this function and the connection relational expression which is connection of functions, sequence data can be expressed with the small amount of data as compared with the former. For this reason, the capacity for becoming possible to transmit in time shorter than before in the case of data transfer, and making sequence data memorize is small, and it is **. Moreover, in this invention, it becomes possible to apply the compression method of the sequence data of this invention in any ladder views by using the circuit pattern defined as a function as a series-connection pattern, a parallel connection pattern, the pattern with which a contact exists independently, the pattern which the output coil connected with the contact in series, and the pattern with which an output coil exists independently.
[0069] Furthermore it can become possible to search the pattern efficiently defined by searching the pattern which set up the train and the line on the ladder view in this invention, and was defined as a function on the basis of this train and line as a function, and sequence data can be compressed efficiently.

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[Translation done.]

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the drawing which expresses the circuit pattern of a series connection in the example which was adapted in this invention.
[Drawing 2] It is the drawing which expresses the circuit pattern of parallel connection in the example which was adapted in this invention.
[Drawing 3] It is a drawing showing the circuit pattern with which a contact exists independently in the example which was adapted in this invention.
[Drawing 4] It is a drawing showing the circuit pattern with which an output coil exists following in-series processing in the example which was adapted in this invention.
[Drawing 5] It is a drawing showing the circuit pattern with which an output coil exists independently in the example which was adapted in this invention.
[Drawing 6] It is the drawing which expresses the circuit pattern of B contact in the example which was adapted in this invention.

[Drawing 7] It is the drawing which set up the train and the line on the ladder view in the example which was adapted in this invention.
[Drawing 8] It is the drawing which applied the block on the ladder view in the example which was adapted in this invention.
[Drawing 9] It is a drawing for explaining the case where the block is parallel in the example which was adapted in this invention.
[Drawing 10] It is a drawing for explaining connection relational expression in the example which was adapted in this invention.
[Drawing 11] It is the flow chart which shows the flow of processing of the example which was adapted in this invention.
[Drawing 12] It is the block diagram which restored the connection relation of a block from the connection data of the sequence data created by the example which was adapted in this invention.
[Drawing 13] It is the drawing which restored each circuit pattern from the function data of the sequence data created by the example which was adapted in this invention.
[Drawing 14] It is the drawing which restored this invention from the sequence data created by the adapted example.
[Drawing 15] It is the ladder view which optimized the drawing shown in drawing 14 .
[Drawing 16] It is a ladder view by other composition for creating sequence data according to the example which was adapted in this invention.
[Drawing 17] It is the drawing which set up the train and the line on the ladder view shown in drawing 16 .
[Drawing 18] It is a drawing for explaining connection relational expression in the example which was adapted in this invention.
[Drawing 19] It is a ladder view.
[Drawing 20] It is the drawing which created sequence data from the ladder view shown in drawing 19 by the conventional method.

[Translation done.]

* NOTICES *



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DRAWINGS

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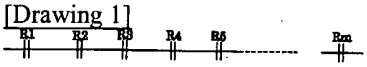
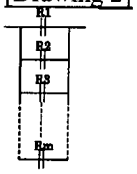
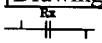
[Drawing 1]



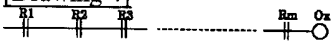

[Drawing 2]



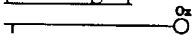

[Drawing 3]



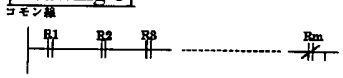

[Drawing 4]



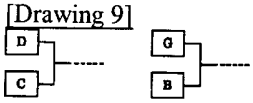

[Drawing 5]



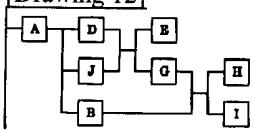

[Drawing 6]



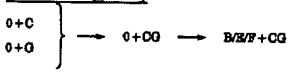

[Drawing 9]



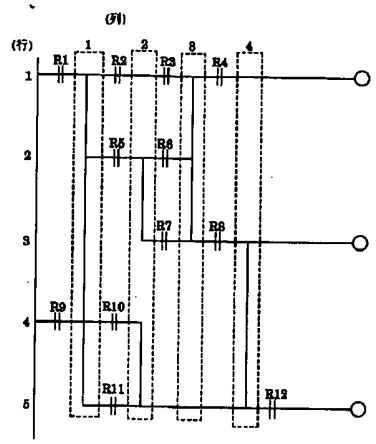

[Drawing 12]



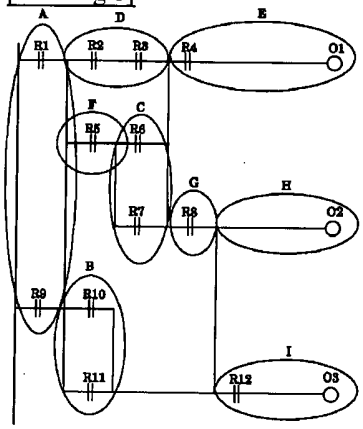

[Drawing 18]



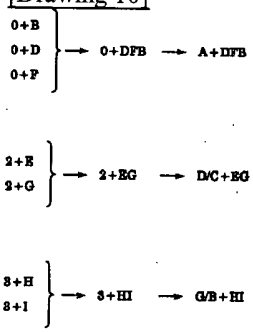

[Drawing 7]



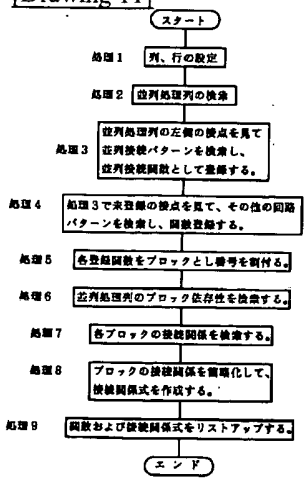

[Drawing 8]



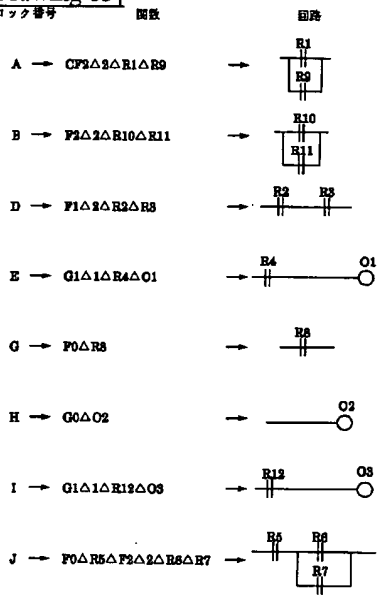

[Drawing 10]



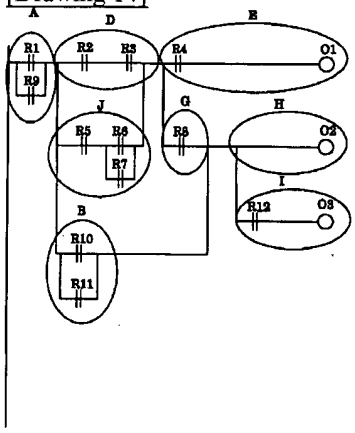

[Drawing 11]



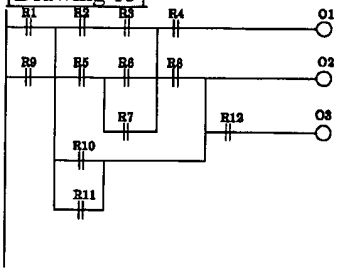
[Drawing 13]



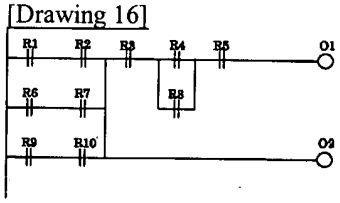

[Drawing 14]



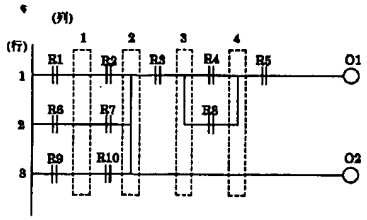

[Drawing 15]



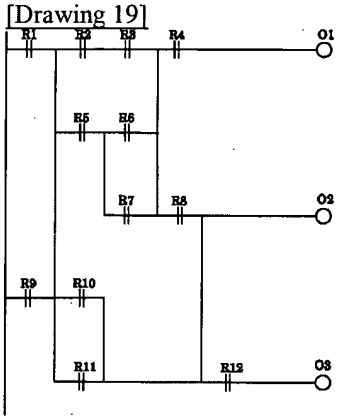

[Drawing 16]




[Drawing 17]




[Drawing 19]




[Drawing 20]

| | | | | | |
|---|---|---|---|---|---|
| LD R1 | POP-OR | POP-OR | POP-OR | PUSH | PUSH |
| PUSH | AND R5 | AND R5 | AND R10 | LD R1 | LD R1 |
| LD R9 | AND R7 | AND R6 | PUSH | PUSH | PUSH |
| PUSH | PUSH | PUSH | LD R1 | LD R9 | LD R9 |
| POP-OR | POP-OR | LD R1 | PUSH | PUSH | PUSH |
| POP-OR | POP-OR | PUSH | LD R9 | POP-OR | POP-OR |
| AND R2 | POP-OR | LD R9 | PUSH | POP-OR | POP-OR |
| AND R3 | AND R4 | PUSH | POP-OR | AND R5 | AND R10 |
| PUSH | OUT O1 | POP-OR | POP-OR | AND R6 | PUSH |
| LD R1 | LD R1 | POP-OR | AND R11 | PUSH | LD R1 |
| PUSH | PUSH | AND R5 | PUSH | LD R1 | PUSH |
| LD R9 | LD R9 | AND R7 | POP-OR | PUSH | LD R9 |
| PUSH | PUSH | PUSH | POP-OR | LD R9 | PUSH |
| POP-OR | POP-OR | POP-OR | POP-OR | PUSH | POP-OR |
| POP-OR | POP-OR | POP-OR | OUT O2 | POP-OR | POP-OR |
| AND R5 | AND R2 | POP-OR | LD R1 | POP-OR | AND R11 |
| AND R6 | AND R3 | AND R8 | PUSH | AND R5 | PUSH |
| PUSH | PUSH | PUSH | LD R9 | AND R7 | POP-OR |
| LD R1 | LD R1 | LD R1 | PUSH | PUSH | POP-OR |
| PUSH | PUSH | PUSH | POP-OR | POP-OR | POP-OR |
| LD R9 | LD R9 | LD R9 | POP-OR | POP-OR | AND R12 |
| PUSH | PUSH | PUSH | AND R2 | POP-OR | OUT O3 |
| POP-OR | POP-OR | POP-OR | AND R3 | AND R8 | |

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[Translation done.]